SKETCH OF THE GLASGOW-PORT WASHINGTON WORKS OF TUSCARAWAS COUNTY.

BY ANDREW ROY.

The black band iron ore of Tuscarawas county, which overlies coal No. 7, forming the roof of the coal, ranges from a few inches to thirteen feet in thickness. It lies well up in the hills, and is everywhere accessible by drift mining. The black band iron ore of Scotland is from eighteen inches to two and a half feet in thickness, and lies deep under ground, necessitating the sinking of costly shafts to reach and mine ore. In Scotland the seam is very persistent, and it is mined with extraordinary vigor in the

counties of Lanark and Ayr, forming the basis of the iron trade which has made Scotland so famous as an iron-producing center. The ore is associated with a seam of splint, or block, or dry-burning coal, fitted for the smelting of ore in a raw state, the coal lying 60—70 feet below the ore; hence, it is the usual practice in that country to raise both coal and black band ore through the same shaft.

In Tuscarawas county, Ohio, although the ore rises to the marvelous thickness of thirteen feet at times, the seam is not continuous where it is due, being deposited in pockets, with an unusual height of ore in the center, which thins down to a feather-edge on the sides of the basin. These pockets never exceed a few acres in extent, and not one acre in a thousand holds the ore where it is due. In Ohio (as in Scotland), the ore belongs to the coal measures, and, as I have said, forms the roof of coal No. 7; this seam being usually about three feet thick in Tuscarawas county. The coal, however, is at this point one of the poorest in quality in the whole range of the Allegheny coal field. Eighty feet below coal No. 7, No. 6, the equivalent of the great vein of New Straitsville and Shawnee, is due; and in the vicinity of the black band district of Tuscarawas county, as in Perry county, the coal is of magnificent thickness, ranging from five to nine feet. To the eye it is a black, lustrous, and commanding looking coal, but, when critically examined, is found to be so largely impregnated with sulphur as to unfit it for furnace use, either in a raw state or as a coke.

The existence of the black band ore of Tuscarawas county was long known to the furnace men of the Tuscarawas Valley, who for a number of years had been using it in connection with the ore of Lake Superior, making a very superior brand of iron, known in the markets as "American-Scotch." The inferior quality of the coals was also well known to the iron manufacturers of Dover and Massillon, who never thought of using them in the furnace.

In 1871, two Scottish practical miners, residents of the United States, having heard of the black band ores of Tuscarawas county, visited that region. Having formed a highly favorable opinion of the district as an iron-producing center, they revisited Scotland and induced a number of furnace men of Glasgow to look into the matter. An engineer was sent to Ohio to examine the prop-

erties, who verified all the representations of the practical miners, and the result was the formation of a company, known as the Glasgow–Port Washington Iron and Coal Company, which was duly incorporated under the acts of 1862–67—laws of England.

The company purchased twelve hundred acres of land, about one and a half miles north of the Pittsburgh, Cincinnati and St. Louis Railroad, near the village of Port Washington, in the heart of the black band region, and supposed by the company, from the representations made them by their engineer, to be very largely underlaid with a deposit of black band ore, from two to thirteen feet in sickness, and with a bed of iron-making coal from five to nine feet in height. The company were greatly elated over their American property, and, as they expressed it, "would coin money among the feet of the Americans."

Two blast-furnaces were erected on the property, only one of which was ever blown in. These furnaces were well and substantially constructed, and were at that time the largest and most skillfully erected blast-furnaces ever erected in the United States. They were completed in August, 1874, at a cost, including blowing-engines and boilers, of three hundred and ninety-four thousand dollars. Each stack was 75 feet in height, 17½ feet bosh, the cubic capacity being 11,500 feet. Each furnace had two hot-blast stoves of 19 feet diameter, 20 feet in height, with 36 U-pipes. The two blast engines had steam cylinders three feet diameter and five feet long, with air-cylinders four feet diameter and eight feet in length. The furnaces were each supported on eight columns ten feet high. A fire-brick establishment was also built at the works, at a cost of thirty-seven thousand dollars, but nothing was ever done in this establishment, as a suitable clay could not be found on the property for the manufacture of fire-brick. A branch road was built from the furnaces to the Pan Handle Railroad, at a cost of sixty thousand dollars. The whole outlay of the company, before the furnance went into blast, exceeded half a million dollars.

The furnace blown in in August, 1874, was kept running for nearly two years. It was a losing concern from the start. The coal on the company's property has, both in a raw state and after being converted into coke, proved a miserable failure. Connellsville coke had to be used, at a cost at the mines of $4.70 per ton.

A tract of land, containing limestone, was purchased too far away from the furnace, and on trial the limestone was unfit for flux. One hundred and thirty acres of coal lands were also bought in Westmoreland county, Pa., which, in practice, was discovered that it cost more to mine and ship the coal to the furnaces than was required to purchase Connellsville coke. The prices paid for mining the ore and preparing it for the blast-furnace were also high beyond all reason.

The furnace remained idle from 1876 until January, 1880. During all this time the managers were engaged with commendable energy in searching for coals and limestone which would make iron. Three holes were drilled down through the coal measures into the underlying Cuyahoga shale, in search of the Briar Hill or Massillon coal, during the fall of 1877. Each of these holes was commenced on the horizon of coal No. 4, and although they had good material all the way down, only a mere trace of the lower coal was met on the horizon where it was due. This coal, which is disposed in small troughs or basins on the margin of the coal field, is supposed by our geologists and mining engineers to be absent everywhere in the central and eastern parts of the coal measures of the State—a conjecture which, so far as the researches of our mining adventurers have yet extended, has been found to be partially correct. The following is the journal of the coal driller:

DRILL NO. I.

Earth	2	Fire-clay rock	14.6
Loose rock of clay	8.8	Dark gray slate	11
Limestone	.11	Gray slate	9
Light gray slate rock	24	Dark gray slate	5
Dark brown slate	9	Iron ore limestone	.6
Brown slate	9.11	Dark gray slate	2.9
Limestone	.7	Light gray slate	5
Fire-clay	6	Gray slate	9.9
Light gray slate	9	Bogy gray slate	7.9
Gray slate rock	15	Black chip slate	1.6
Brown slate	2.1	Gray slate	6
Gray slate	28.1	Dark brown slate	19.3
Limestone	1	Gray slate	16.8
Limestone strong with iron	1	Light gray slate rock	16.8
Limestone	2	Gray slate	6
Coal	.6	Light gray slate rock	13
Fire-clay	.6	Poor gray slate	5.5
Gray slate	18	Gray slate rock	14
Seam of rock	1.3	Poor gray slate, blue streaks	12.9
Gray slate rock	7	Fire-clay	4
Fire-clay	5		332.

DRILL NO. 2.

Earth	10	Coal and sulphur	.7
Muddy slate	9.5	Black slate	1
Gray slate	11.5	Fire-clay	5
Black and gray slate	22.10	Gray slate	12.3
Limestone	1	Limestone	2.11
Gray slate	3	Brown slate	22.6
Fire-clay	3	Coal	.3
Gray slate and gray rock	28.2	Gray slate	22.2
Fire-clay rock	11.4	Bogy gray slate	53.7
Brown slate	6	Coal	.1
Very hard gray rock	2.8	Gray slate	58.1
Limestone	2.9	Black slate	1.6
Gray slate	7.4	Light gray slate	7.8
Limestone	.10		
Limestone with ore	1.1		310.3
Limestone	1.10		

DRILL NO. 3.

To solid material	28	Coal and sulpur	.6
Fire-clay	6	Gray slate	79.1
Gray slate	35.3	Sand rock	11.7
Limestone	5.7	Gray slate rock	11.9
Gray slate	5.9	Sand rock	10
Limetsone	3.8	Dark gray slate	3.6
Black slate	.9	Brown slate	4.6
Coal	.5	Dark gray slate	4.6
Light gray slate rock	8.9	Brown slate rock	7.3
Gray slate	8.6	Gray slate	17.11
Limestone	1.2	Flag rock	6
Gray slate	24.2		
Brown slate	18		323.8
Gray slate	21.1		

Failing to find the lower coal of the state series, which is so often a splendid furnace coal, fitted for furnace use as it comes from the miner's pick, the managers turned their attention to experimenting with coals Nos. 4 and 5, which were found on the property, varying in height from 2½ to 3½ feet. Coal No. 5 showed well, and although it failed to give satisfaction when tried in the furnace, I am of the opinion that if properly cleaned and sorted, this coal could be used successfully in the furnace. Dr. Hays, the chemist, in Pittsburgh, to whom samples of the coal was sent for analysis, said of it: "It is better than New Castle (England) coke, being almost identical with it as regards sulphur, and containing three per cent. less ash. It is certainly the best coke which I have received from your vicinity." The Cambria

Iron Company, of Johnstown, Pa., to whom a sample was sent for trial in the blast-furnaces of that company, reported that "they found its physical structure for furnace use to be good, and that with judicious management a good iron could be made from the coke; that in celluler structure the coke is a first-class furnace fuel." I visited the property of the Glasgow–Port Washington Company in 1878, and saw the coal as it laid on the bank newly mined by the miners, and it impressed me as a coal of good quality. It contained iron pirites, but they were distributed throughout the seam in horizontal layers, and with proper care could have been removed by the miners in excavating the mineral, or by an inspector after the coal was sent out of the mine.

With the revival of the iron trade in the fall of 1879, preparations were made to blow in again, and in January, 1880, one furnace was put in blast, and earnest preparations made to blow in the other, but it was never done, the decline in prices having come before the managers got ready to blow in. This second trial lasted about a year, and, as in the former one, the company lost money heavily. The new coal upon which the hopes of success were built failed to give satisfaction, and Connellsville coke was again exclusively used. So well satisfied was the manager that the new coal would prove satisfactory, that he caused to be constructed, at an enormous outlay, a tram-road and inclined plane from the furnaces to the mines, two miles in length. The manager, himself a chemist, made repeated analyses of the coal, in addition to the analysis of Dr. Hays, of Pittsburgh, and the practical tests by the Cambria Iron Company in their blast-furnaces at Johnstown. The furnace went out of blast in May, 1881, and in the spring of 1882 the works were sold to a firm in Pittsburgh, the Scotch Company, having sunk, in their American enterprise, nearly one million dollars.